

**Journal of Endodontics, 1996, Vol. 22**

**SEPTEMBER**

**Col. Schindler, Chairman Of Endodontics  
59th MDW Dental Directorate  
Lackland AFB, TX**

## **Articles:**

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- **Effect of calcium hydroxide and combinations of Ledermix and calcium hydroxide on inflamed pulp in dog teeth**
- **Alterations in Macrophages after Exposure to Root Canal Filling Materials**
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- **Anesthetic Efficacy of the Intraosseous Injection after an Inferior Alveolar Nerve Block**
- **Effect of ultrasonic vibration on post removal in extracted human premolar teeth**

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**SEPTEMBER (CONT.)**

**Col. Schindler, Chairman Of Endodontics  
59th MDW Dental Directorate  
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## **Articles:**

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- **New Ultrasonic Canal Preparation System with Electronic Monitoring of File Tip Position**
- **Management of a maxillary canine with dens invaginatus and a vital pulp**

## **Effect of calcium hydroxide and combinations of Ledermix and calcium hydroxide on inflamed pulp in dog teeth**

*Sazak H, Günday M, Alatli C. Effect of calcium hydroxide and combinations of Ledermix and calcium hydroxide on inflamed pulp in dog teeth. J Endodon 1996;22:447-9.*

**PURPOSE:** To study the effects of Ledermix + Ca(OH)<sub>2</sub> or Ca(OH)<sub>2</sub> alone on inflamed pulp tissues of dogs.

**M&M:** Fifty-nine upper incisor teeth of 10 dogs were used. Five were lost during the preparation of histopathological sections. Eighteen teeth of 3 dogs were used for each observation period. Class V cavities were prepared and filled with amalgam after placement of decayed dentin particles. After 7 days, five of these teeth were used as a control group, and in the remainder the decayed dentin particles and alloy were removed, and the pulps of the teeth were exposed. Ledermix and Ca(OH)<sub>2</sub> mixtures or Ca(OH)<sub>2</sub> alone were applied to the cavities. All cavities were filled with zinc oxide-eugenol. At the end of 7, 30, and 90 days, the teeth were extracted and examined histopathologically.

**RESULTS:** Inflammatory reactions occurred in all of the control pulps. Inflammation was found to be more prevalent in the 7- and 30-day groups that were treated with the Ledermix + Ca(OH)<sub>2</sub> combination, whereas fibrosis and necrosis were nearly similar in both groups. In the 90-day groups, no inflammation was seen. No difference between the two 90-day groups with regard to reparative dentin was found. Complete dentin bridging that covered the perforation area was found in one tooth in each group.

**C&C:** Ledermix is a preparation containing both a corticosteroid and antibiotic. It consists of triamcinolone acetonide and demethylchlore tetracycline calcium. The use of this mixture had the opposite effect of what was anticipated regarding inflammatory response.

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**Orest Harkacz, Sr.**

## Alterations in Macrophages after Exposure to Root Canal Filling Materials

*Maseki T, Yasumura K, Nanba I, Kobayashi F, Nakamura H. Alterations in Macrophages after Exposure to Root Canal Filling Materials. J Endodon 1996;22:450-4.*

**Purpose:** To investigate in macrophages in vitro the process of engulfment of various root canal filling materials.

**M&M:** Rat peritoneal macrophages were collected & cultured. Canals, Canals-N, Sealapex and Finapec APC were mixed, allowed to set, sterilized, crushed & cleansed to obtain materials with a diameter of 5  $\mu\text{m}$ . Macrophages were placed in culture plates with each of the materials. At 30, 60 & 120 minutes, macrophages were removed for evaluation. After staining, the number of macro's that had phagocytosed particles and viable macrophages were counted. They were fixed and evaluated with SEM.

**Results:** Finapec APC had the highest rate of engulfment at all time periods. Canals had the lowest, with Canals-N and Sealapex were at about 30 - 40%. Finapec APC showed ~ 95% viable cells at 60 & 120 min. Canals-N & Sealapex had 78 & 85% viability, and Canals at 120 min. had 63%. Multiple ruffle formation was evident in the Finapec APC group and less extensive in the Canals-N & Sealapex groups. Canals groups macrophages had many vacuoles, & many were nonviable.

**C&C:** This is a sealer toxicity study. The higher the rate of engulfment, viability, and ruffle formation, the lower the toxicity of the agent. Finapec APC is a sealer containing hydroxyapatite in the powder, & Guaiacol, rosin and eucalyptol in the liquid. Canals is a Zinc oxide sealer, with clove & peanut oil. Canals-N is zinc oxide and rosin in the powder, and fatty acid and propylene glycol in the liquid. Sealapex is a calcium hydroxide sealer. Finapec does not seem to cause damage to the macrophages, & thus is much less toxic than Canals. It is manufactured in Japan.

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Robin E. Hinrichs

## **Steroids reduce the periapical inflammatory and neural changes after pulpectomy**

*Holland GR. Steroids reduce the periapical inflammatory and neural changes after pulpectomy. J Endodon 1996;22:455-8.*

**PURPOSE:** To test the hypothesis that inflammation must be eliminated to avoid persisting neural sprouting using a higher dose of steroid than that used in an earlier study.

**M&M:** Root canal treatment, including obturation with gutta-percha and a zinc oxide and eugenol sealer, was conducted, under general anesthesia, on the canine teeth of 13 young ferrets. Seven of the ferrets were given 0.5 mg/kg dexamethasone daily beginning on the day after the root canal procedure. Six animals that had not received root canal treatment were also given dexamethasone in the same dosage. One animal received neither root canal therapy nor dexamethasone. Three months after the root canal treatment, under general anesthesia, the animals were perfused with fixative and the canine periapical tissues were prepared for histological examination. The extent of periapical inflammation was measured and the degree of neural sprouting in the periodontal and subapical regions was estimated.

**RESULTS:** Periapical lesions in steroid-treated animals were 30% of the size of those in untreated animals. Innervation density in the subapical region of the steroid-treated animals was lower than that in the animals who did not receive steroids and not significantly different from controls. Reduction in periapical inflammation induced by systemic steroids is accompanied by a reduction in neural sprouting.

**C&C:** Inflammatory mediators fulfill a wide range of roles, including algogenesis (pain production), vasodilation, and chemotaction, and may be neurotrophic. As Kimberly and Byers have pointed out, macrophages stimulate nerve growth factor and thus neural sprouting via interleukin-1. There may be several neurotrophic factors present in inflammatory lesions, and these may enhance the neuron's own regenerative powers. In the absence of the target organ originally supplied by the damaged nerves (the pulp) and in the presence of a continuing neurotrophic stimulus, sprouting may continue indefinitely. When no inflammation is present, damaged pulpal nerves probably innervate new targets or contribute to the periodontal innervation in an orderly fashion. The present findings support this hypothesis to the extent that a reduction in size of the inflammatory lesions results in a reduction in neural sprouting and a pattern of periapical innervation that is not significantly different from controls.

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**Orest Harkacz, Sr.**

## **Clinical Evaluation of Bacterial Leakage of Endodontic Temporary Filling Materials**

*Beach CW, Calhoun JC, Bramwell JD, Hutter JW, Miller GA. Clinical Evaluation of Bacterial Leakage of Endodontic Temporary Filling Materials. J Endodon 1996;22:459-62.*

**Purpose:** To evaluate Cavit, IRM, and TERM temporary restorative materials for bacterial leakage in a human clinical study.

**M&M:** After obturation of the root canal system, the pulp chamber was irrigated with NaOCl-soaked pellet for 1 minute & rinsed. A paper disk with transport media was placed in the chamber to acquire a prerestoration sample. The postrestoration sample was obtained by placing a paper disk in the chamber, beneath 4 mm of either Cavit, IRM or TERM. After 3 weeks, the disk was removed and cultured, and the organisms were identified.

**Results:** Of the 51 samples, 4/14 Term, 1/18 IRM, and 0/19 Cavit samples showed positive growth. Cavit was statistically better than TERM.

**C&C:** A nice design. Using clinical root canals allowed for all the variable like saliva, masticatory forces, thermal cycling to be tested. Cavit may be exerting a bactericidal effect.

**September 1996**

**Robin E. Hinrichs**

## Sealing ability of five different retrograde filling materials

*Gerhards F, Wagner W. Sealing ability of five different retrograde filling materials. J Endodon 1996;22:463-66.*

**PURPOSE:** To verify the sealing ability of five different retrograde filling materials by means of a modified dye penetration technique.

**M&M:** One hundred extracted human mandibular and maxillary single-rooted teeth were used. The crowns were separated and the canals prepared with a step-back preparation to one size larger than that binding at the working length. Standardized paper cones were fixed with Harvard-Cement in the root canals. The apical 3 mm of each tooth was resected. Retrograde cavities were made 2 mm deep with an inverted cone and microangle handpiece. Teeth were assigned to five different groups (n = 20). The diameter of the apical preparation was equally distributed. Cavities were filled with the following: a spherical amalgam (Amalcap-plus), viscously mixed Diaket (a resin-based material), Ketac-Endo (a glass-ionomer), Harvard-Cement (a zinc phosphate-based cement), and gold foil. Surfaces of the teeth were isolated with nail polish. Teeth were stored in 1% methylene blue dye for 72 hours. Roots were sectioned, and the depth of dye penetration was evaluated through a stereomicroscope.

**RESULTS:** With the exception of Ketac-Endo, there was a large scattering of the results within every group. Teeth retrofilled with Ketac-Endo showed the least amount of dye penetration (only 2 of 20 specimens showed dye penetration), and even incomplete fillings with voids gave a hermetic seal. Retrofills with Ketac-Endo showed significantly less leakage compared with amalgam. There was no significant difference between amalgam and Diaket. Sealing ability of Harvard-Cement and gold foil was less than amalgam.

**C&C:** There was no mention whether cavity varnish was used with the amalgam or not. In the picture showing the Ketac-Endo retrofill with voids, the voids were discolored. If the material provided a hermetic seal, how did the isolated voids become stained?

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Orest Harkacz, Sr.

## **A Scanning Electron Microscopic Evaluation of the Debridement Capability of Sodium Hypochlorite at Different Temperatures**

*Berutti E, Marini R. A Scanning Electron Microscopic Evaluation of the Debridement Capability of Sodium Hypochlorite at Different Temperatures. J Endodon 1996;22:467-70.*

**Purpose:** To compare the debridement capability of 5% NaOCl at 21 C and 50C.

**M&M:** 22 decoronated incisors were instrumented in exactly the same manner, with volumes of irrigant strictly controlled. The only difference was NaOCl temp, 21 & 50 C. Specimens were dehydrated, fractured into halves & examined with an SEM in the middle & apical thirds of each canal.

**Results:** In the middle third, the 50 C specimens had a much thinner, delicate smear layer with some open tubules. At 21C the smear layer was well organized, thick & formed of coarse particles. In the apical third, both sets of specimens were similar. The only difference was that at 21 C it was coarse & grainy, & at 50 C it was finer & more regular. No organic material was seen.

**C&C:** So perhaps instead of having to decide a simple yes or no to the presence of a smear layer, we can use the 50 C NaOCl to obtain a thin one. It's presence may still afford some physical barrier to bacterial penetration of the tubules, & might be thin enough to obtain some of its antimicrobial activity.

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**Robin E. Hinrichs**



## Evaluation of coronal microleakage after endodontic treatment

*Roghanizad N, Jones JJ. Evaluation of coronal microleakage after endodontic treatment. J Endodon 1996;22:471-3.*

**PURPOSE:** To suggest a new way of coronally sealing root canals right after therapy by the endodontist.

**M&M:** Root canal therapy was done on 94 extracted human maxillary centrals with intact roots and no previous root canal treatment. The crowns were removed at the CEJ, and the canals prepared using the step-back method. Gutta-percha was vertically condensed at the orifice of the canals. The teeth were randomly placed into four groups, depending on the sealing material to be used for the coronal seal. Groups 1 through 3 were designated as experimental groups with 28 teeth each, whereas group 4 consisted of 10 control teeth (5 positive and 5 negative). Three mm of the coronal gutta-percha was replaced by either Cavit, TERM, or amalgam (with two coats of cavity varnish) in the experimental groups. Gutta-percha was kept intact at the canal's orifice of specimens in group 4. After thermocycling and 2 weeks immersion in 2% methylene blue dye, the amount of dye penetration was measured.

**RESULTS:** The negative controls demonstrated no dye penetration, whereas the positive controls showed extensive dye penetration. Of the teeth filled with amalgam, 3.6% showed total leakage compared with 25% for Cavit and 25.8% for TERM. Amalgam showed a significantly better seal than Cavit and TERM. There was no statistically significant difference between TERM and Cavit.

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Orest Harkacz, Sr.

## **A Comparison of Canal Preparation Using the K-File and Lightspeed in Resin Blocks**

*Tharuni SL, Paramiswaran A, Sukumaran VG. A Comparison of Canal Preparation Using the K-File and Lightspeed in Resin Blocks. J Endodon 1996;22:474-6.*

Purpose: To compare & evaluate the efficiency of curved canal preparation using LightSpeed and K-Files in simulated canals of known curvature in resin blocks.

M&M: K-files with a filing motion & LightSpeed at 1200 Rpm were used to instrument 24 Endo-Vu blocks. Pre- & post-instrumentation radiographs were taken after filling the canals with a radiopaque dye. Photos were made, & canal widths measured.

Results: At 1 & 3 mm from the apex, the K-Files had significantly greater change in the width of the canal space. 100% of the K-File samples had elbow formation, for LightSpeed it was 18.18% There were no significant differences in the change of width of canal at the 5 & 7 mm levels.

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## Retrograde root filling with dentin-bonded modified resin composite

*Rud J, Rud V, Munksgaard EC. Retrograde root filling with dentin-bonded modified resin composite. J Endodon 1996;22:477-80.*

**PURPOSE:** To compare 1-yr results obtained by the use of silver resin composite with that of ytterbium trifluoride resin composite. In addition, the aim was to investigate long-term results after ytterbium trifluoride Retroplast treatment.

**M&M:** Retroplast containing ytterbium trifluoride was used as previously described by Rud et al. Apical fillings (351) placed from June 1990 to June 1992 using the modified Retroplast material with Gluma bonding agent were evaluated. Radiographic assessment was performed using the criteria reported by Rud et al. Using this criteria, the results are divided into four categories: complete healing, fibrous scar healing or incomplete healing, uncertain healing, and failure. The healing evaluation was made independently by two of the authors.

**RESULTS:** Retroplast with ytterbium trifluoride showed satisfactory radiopacity and handling characteristics. The overall frequency of healing after 1 year was 281 with complete healing (80%), 6 scar tissue (2%), 42 uncertain healing (12%), and 22 failure (6%). The overall frequency within the four types of healing obtained with Retroplast containing ytterbium trifluoride was not significantly different from that obtained with Retroplast containing silver. Cases with ytterbium trifluoride classified as scar tissue and uncertain healing at 1 year when examined at 2 to 4 years postoperatively showed 89% complete healing, 0% scar tissue, 1% uncertain healing, and 9% failure. This result is significantly different from that obtained 1 year after surgery. Based on calculations, it was predicted that with time, 90% will become complete healing, whereas 10% will become failure. Among the reasons for the failures: the Retroplast was loosened in three cases, and secondary unfilled root canals were found in three mandibular roots (1 premolar and 2 incisors).

**C&C:** The authors have used Retroplast with the Gluma dentin bonding agent since 1984 as a retrograde root-end cover. The original Retroplast formula contained silver to promote radiopacity. However, the silver was found to lower the working time and storage stability of the composite. Also, it was feared that the silver might cause discoloration. To eliminate these side effects, the silver was replaced with ytterbium trifluoride in 1990. This study was performed to see if any differences existed between the two formulations clinically. The authors *do not* make cavity preparations with their root end fillings; they just slightly hollow the surface and cover the root end with a “cap” of composite.

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Orest Harkacz, Sr.

## **Anesthetic Efficacy of the Intraosseous Injection after an Inferior Alveolar Nerve Block**

*Dunbar D, Reader A, Nist R, Beck M, Meyers WJ. Anesthetic Efficacy of the Intraosseous Injection after an Inferior Alveolar Nerve Block. J Endodon 1996;22:481-6.*

**Purpose:** To determine the anesthetic efficacy of an IO injection when added to an IAN block in mandibular 1st molars.

**M&M:** 40 human subjects randomly received either a combination IAN block & IO injection with a Stabident, or an IAN block & mock IO injection at 2 successive appts 1 week apart. Each subject received each block combination in the study. Pulp testing was done every 2 minutes following the IO injection, for 60 minutes. A successful block was defined as reaching 80 on an EPT w/in 15 min & remaining there for the duration. Block failure was when the subject never achieved two consecutive 80 readings. Slow onset & short duration were also defined & noted. Postinjection questionnaires asked the subjects to rate pain & any side effects in the area of the IAN & IO injections at the time initial numbness wore off & 3 days later.

**Results:** Anesthetic success w/ the IAN blocks occurred 42% of the 1st molars, 45% of the 2nd molars, and 38% of the 2nd premolars. Anesthetic success for the combination IAN & IO injections occurred in 90% of the 1st molars, 88% of the 2nd molars, & 72% of the 2nd premolars. No failures of anesthesia or slow onset occurred in the 1st molars with the IAN & IO. 32% of 1st molars had anesthetic failure, & 18% had slow onset with the IAN alone. 10% of 1st molars had short duration with the IAN & IO, & 12% with the IAN only. Post injection pain with the IAN was none to mild when the numbness wore off in 95% of the IAN blocks, & 98% in the IO blocks. 16/20 subjects reported an increase in heart rate during the IO solution deposition, none in the mock IO injection.

**C&C:** The IO injection is a reliable adjunct to an IAN block. The post injection pain is less than that reported with a PDL injection. Care should be taken in pts sensitive to epinephrine, as it is basically an intravenous injection.

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**Robin E. Hinrichs**

## **Effect of ultrasonic vibration on post removal in extracted human premolar teeth**

*Johnson WT, Leary JM, Boyer DB. Effect of ultrasonic vibration on post removal in extracted human premolar teeth. J Endodon 1996;22:487-8.*

**PURPOSE:** To determine the effectiveness of ultrasonic vibration in removing Paraposts from extracted teeth.

**M&M:** Thirty-six extracted human mandibular premolars had their crowns resected and the canals prepared apically to a size 40 K-type file with step back preparation. The canals were obturated with gutta-percha and sealer. Post space was created with a 5 to 7 plugger to the depth of 9 mm. Paraposts were cemented in the premolars with zinc phosphate cement and the teeth placed in four groups. Group 1 received no vibration; group 2 received vibration for 4 minutes (using the ENAC ultrasonic unit at high power); group 3 received vibration for 12 minutes; and group 4 received vibration for 16 minutes. Tensile forces were applied to the posts and mean dislodgment forces compared.

**RESULTS:** The mean force (kg) required to dislodge the Parapost in group 1 was  $24.92 \pm 1.64$  SEM; in group 2,  $25.01 \pm 1.80$ ; in group 3,  $24.08 \pm 2.29$ ; and in group 4,  $12.41 \pm 2.60$ . There was a significant difference between group 4 and groups 1 to 3.

**C&C:** The results of this study indicate that 16 minutes with the ultrasonic vibration is an effective method for removing this Parapost system from human premolar teeth. The study did not take into account any rotational forces which might be applied to the tooth. Different vibration times would be expected with different post cementation depths.

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**Orest Harkacz, Sr.**

## **New Ultrasonic Canal Preparation System with Electronic Monitoring of File Tip Position**

*Kobayashi C, Yoshioka T, Suda H. A New Ultrasonic Canal Preparation System with Electronic Monitoring of File Tip Position. J Endodon 1996;22:489-92*

**Purpose:** To introduce a new canal preparation system & report on an invitro study using it.

**M&M:** A new ultrasonic preparation instrument called the Solfy ZX has a built in apex locator in the file. An autostop mechanism that halts the vibration of the file at any desired position on the meter is incorporated. 54 teeth were sliced on one side, radiographed. They were fixed to a model that could electronically measure the root canal length. The teeth were prepared at power 2, or at power 4. The autostop bar was set on 1 or 2. K-files or NiTi files were used in the instrument. All preparation was done ultrasonically after patency was confirmed with a #10 K-File. No preoperative length determination was taken. Canals were enlarged to #35 in sequence. Pre- & post-operative tracings of contact microradiographs were compared.

**Results:** The autostop worked well, but when it was set on one, overenlargements of the apical foramina were frequent. Ultrasonic vibration at power 4 tended to transform and straighten the root canal, and the only files broken in this study were at this setting. When Gates-Glidden drills were used to preflare, the working time was reduced. When NiTi files were used, the transportation of the canals was minimal.

**C&C:** The idea for this is outstanding. Combining an apex locator and your preparation instruments & having it operable during your entire instrumentation would be a great advantage. One drawback however, is the delivery system for irrigant. It utilizes a sterile water spray delivered using a syringe. A more efficient delivery system, combined with an antimicrobial irrigant should be developed. The fact that only one tooth ledged out of 54 is pretty impressive.

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**Robin E. Hinrichs**

## **Management of a maxillary canine with dens invaginatus and a vital pulp**

*Schwartz SA, Schindler WG. Management of a maxillary canine with dens invaginatus and a vital pulp. J Endodon 1996;22:493-6.*

**PURPOSE:** To report an unusual case involving a maxillary canine with dens invaginatus (Oehler's type 3 invagination), associated chronic periradicular periodontitis, and a vital pulp.

**SUMMARY:** A 16-yr-old female was referred for evaluation and treatment of a painful maxillary anterior tooth. The maxillary left canine was responsive to cold (skin refrigerant) and electric pulp testing. The adjacent teeth also responded normally. Perio, palpation and percussion were WNL. Diagnosis was vital pulp and dens invaginatus (Oehler's type 3 invagination) with associated chronic periradicular periodontitis of tooth #11. Nonsurgical management of the invaginated space was completed, which retained pulp vitality and resulted in resolution of the periradicular radiolucency.

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